CHAPTER V
CONCLUSION

5.1 Conclusions

The simultaneous production of hydrogen and methane from biodiesel wastewater which added glycerine 3.5 % w/v was studied by using two-stage ASBR unit with 4 and 24 l of working volumes, respectively operated under mesophilic temperature (37 °C) with a recycle ratio of 1:1. For hydrogen ASBR unit was controlled at pH 5.5, the optimum COD loading rate was found at 67.50 kg/m^3 d which gave the highest hydrogen production performance in terms of the maximum hydrogen production rate (1.4 l/d), the maximum hydrogen percentage (31.7%), the maximum hydrogen yield (7.8 ml H_2/ g COD removed or 4.9 ml H_2/g COD applied), and the maximum specific hydrogen production rate, SHPR (88.9 ml H_2/g MLVSS d or 332.5 ml H_2/ l d). For methane ASBR unit operated without control pH and optimum COD loading rate was found at 11.25 kg/m^3 d. At this optimum COD loading rate gave the highest methane production performance in terms of the maximum methane production rate (16.15 l/d), the maximum methane percentage (74.8%), the maximum methane yield (128.4 ml CH_4/g COD removed or 47.3 ml CH_4/g COD applied) and the maximum specific methane production rate, SMPR (233 ml CH_4/g MLVSS d or 672.8 ml CH_4/l d).

The overall performance of two-stage ASBR unit, total COD loading rate was found at 9.64 kg/m^3 d which provided the highest total hydrogen and methane production performance in terms of the maximum hydrogen production rate (4.3 l/d) and the maximum methane production rate (9.91 l/d), the maximum hydrogen percentage (16.65%) and the maximum methane percentage (38.42%), the maximum hydrogen yield (12.3 ml H_2/ g COD applied) and the maximum methane yield (121.2 ml CH_4/ g COD applied), and the maximum specific hydrogen production rate, SHPR (60 ml H_2/l d) and the maximum specific methane production rate, SMPR (581 ml CH_4/l d).

At higher COD (84.38 kg/m^3 d based on hydrogen volume or 14.06 kg/m^3 d based on methane volume) and total COD loading rate (12.05 kg/m^3 d), both hydrogen and methane production performance decreased because of volatile fatty acid (VFA) accumulation in the system.

5.2 Recommendations

There are many literatures about hydrogen production from glycerine under anaerobic fermentation and those research were operated under thermophilic condition and seed sludge heat treatment. Moreover, the other impurities was also removed from glycerine before use it. These conditions gave high both hydrogen and methane production performance. Therefore, it is interesting for the study of hydrogen and methane production from biodiesel wastewater using ASBR reactor under thermophilic condition, seed sludge heat treatment and purify glycerine.